NEW YORK ENTOMOLOGICAL SOCIETY
91(1), 1983, pp. 57–62

THE SMALL MILKWEED BUG, *LYGAEUS KALMII* (HEMIPTERA: LYGAEIDAE): MILKWEED SPECIALIST OR OPPORTUNIST?

A. G. Wheeler, Jr.

Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg, Pennsylvania 17110

Abstract.—*Lygaeus kalmii* Stål, the small milkweed bug, often is considered a milkweed specialist. A review of recent literature and observations of nymphs and adults on composites (Asteraceae) and plants of other families in Missouri, Pennsylvania, and West Virginia show that *L. kalmii* uses various food sources. The feeding strategies of this lygaeid are briefly compared with those of *Oncopeltus fasciatus* (Dallas), a lygaeine restricted to milkweeds and related plants, and the Palearctic *Lygaeus equestris* (L.), which prefers asclepiads but feeds on plants of numerous families.

Relatively few North American insects have been thoroughly studied, and when a particular species is considered biologically well known, further investigation may be stifled. Any misconceptions about the habits of that species often are perpetuated in the literature and are difficult to rectify.

Any large, strikingly colored insect, especially a common one, is apt to convey the impression "well studied." Indeed, aposematic species of the lygaeid genera *Oncopeltus* and *Lygaeus* have long been characterized as milkweed feeders and are now known to sequester and store cardenolides (cardiac glycosides) from their hosts (Duffey and Scudder, 1972; Scudder and Duffey, 1972). *L. kalmii* Stål, known in the United States by the approved common name small milkweed bug, sometimes has been assumed representative of the specialized fauna associated with the Asclepiadaceae. Caldwell (1974) considered its utilization of resources similar to that of *O. fasciatus* (Dallas), a definite milkweed specialist, although he acknowledged the biology of *L. kalmii* was not as well known. Dailey et al. (1978) referred to both lygaeine species as "milkweed-specific."

Several species of *Lygaeus,* however, seem to furnish examples of hard-to-correct biological misconceptions. *L. turcicus* F., a close relative of *kalmii,* has been considered a milkweed bug although specific observations were lacking. Published records from *Asclepias* spp. are unreliable because many

---

The publication costs of this article were defrayed in part by page charge payment. This article must therefore be hereby marked *"Advertisement"* in accordance with 18 U.S.C. §1734 solely to indicate this fact.

observers did not distinguish *turcicus* from *kalmii*. Slater (1983, this issue) has shown that *turcicus* feeds mainly on composites, especially ox-eye [*Heliopsis helianthoides* (L.) Sweet], rarely, if ever, developing on milkweeds.

Slater's paper, which I had the opportunity to review, prompted me to reevaluate my collections of *L. kalmii* from various composites, considered merely fortuitous when first made in 1977. Recent papers by Isman et al. (1977), Hunt (1979), and Duarte and Calabrese (1982) also led me to reappraise the habits of *L. kalmii*. Isman et al. found adults of *kalmii* collected from *Asclepias* spp. in California varied widely in their cardenolide content; they suggested that some of the adults might have developed on hosts lacking these compounds. In Michigan, Hunt described *kalmii* as an opportunist that feeds on various food sources, especially when milkweed pods are unavailable. After determining that the chromosome number and sex determination mechanism of populations in west Texas differed from those previously recorded, Duarte and Calabrese suggested *L. kalmii* might represent a sibling complex.

Herein I summarize my records of *L. kalmii* taken on plants other than milkweeds. Through the courtesy of the Rev. James M. Sullivan, who has made extensive collections of Hemiptera-Heteroptera (see Slater, 1983), I am able to refer to his observations of *kalmii* on various plants in Missouri. My Pennsylvania and West Virginia observations and those made in Missouri refer to the subspecies *angustomarginatus* Parshley (see Slater and Knop, 1969). On the basis of these observations tentative conclusions are drawn regarding the feeding strategies of this lygaeid.

OBSERVATIONS ON COMPOSITES

In late July 1977 I collected an adult and a 5th-instar nymph on the seed heads of yarrow, *Achillea millefolium* L. (Asteraceae = Compositae), in Adams County, Pennsylvania. Adults and a 5th instar were observed on heads of yarrow on a return visit to this site in mid-August 1982. At about this time I found 5 nymphs (instars III–V) and adults on heads of yarrow growing in an old field on Dolly Sods, a wilderness area at approximately 4,000 ft. (1,219 m) in Tucker County, West Virginia. Milkweeds were not observed in the vicinity (40–50 m) of either collecting site.

I found a larger population of *L. kalmii* associated with *Senecio vulgaris* L. growing in isolated colonies in an otherwise weed-free nursery in Somerset County, Pennsylvania. On 14 July 1982 about 10 mating pairs were observed on inflorescences and seed heads (dried capitula); many more adults were found beneath the plants. A thorough examination of the nursery beds and nearby hedgerows did not reveal any milkweeds or the association of *kalmii* with other composite or weed species. Two weeks later adults were common on the ground beneath *S. vulgaris*; 2 adults, a 3rd, and a 5th instar were collected on mature heads. On 19 August no nymphs were observed, but 3

adults were taken on fruiting heads and others were observed beneath *Senecio.*

During July and August I collected small numbers of late instars, usually only 1 or 2 individuals, on fruiting heads or inflorescences of *Centaurea maculosa* Lam., *Conyza canadensis* (L.) Cronq., and *Erigeron strigosus* Muhl. Adults only were collected on seed heads of *Ambrosia artemesiifolia* L., *Chondrilla juncea* L., *Daucus carota* L., and *Eupatorium perfoliatum* L.

In Missouri the Rev. Sullivan has observed *L. kalmii* visiting flowers in succession, apparently taking nectar from *Eupatorium altissimum* L. and *Solidago graminifolia* (L.) Salisb. In early March an adult was taken on the fresh receptacle of dandelion, *Taraxacum* sp., and in April on a dandelion flower and in gravel beneath the plants. During July–October adults were observed on inflorescences or old flower heads of *Cirsium altissimum* (L.) Spreng., *Eupatorium rugosum* Houtt., *Lactuca saligna* L., *Solidago altissimum* L., and *Tragopogon dubius* Scop.; apparent feeding took place on several of the plants. In October a mating pair was found on the dried heads of *Helianthus annuus* L. In the literature a mating pair is known from goldenrod, *Solidago* sp. (Procter, 1946), and on goldenrod Balduf (1943) observed an adult feeding on a dead honeybee. Maw (1976) swept *L. kalmii* from *Cirsium* and *Taraxacum.*

Lygaeus kalmii ON PLANTS OF OTHER FAMILIES

Occasionally I found nymphs of *L. kalmii* on nonmilkweed plants other than composites. Thirty or more nymphs (instars II–V) and a smaller number of adults were observed in August on mature inflorescences of buckwheat, *Fagopyrum sagittatum* Gilib. (Polygonaceae). The small field, well removed from milkweed and nearly weed free except for a few plants of common ragweed, *Ambrosia artemesiifolia,* was bordered by a pure stand of ragweed. No nymphs or adults, however, were observed or swept from ragweed. Smaller numbers of nymphs (1 or 2 individuals of instars III–V) were taken during August on *Hypericum punctatum* Lam. (Hypericaceae = Guttiferae) and on or under *Euphorbia* spp. (Euphorbiaceae) growing in isolated colonies in ballast along railroad tracks. In Missouri, the Rev. Sullivan observed 2 adults in early September on fruits of *Euphorbia* sp. He also observed probable feeding in late August on the calyx of *Campanula americana* L. (Campanulaceae) and 3 adults beneath these plants; in mid-October he found an adult with its rostrum inserted in a capsule of *Scrophularia marilandica* L. (Scrophulariaceae). In mid-September he collected an adult from an unripe fruit of *Datura stramonium* L. (Solanaceae).

DISCUSSION

The observations here summarized, and the studies of Hunt (1979), suggest that *L. kalmii* is not as intimately associated with Asclepiadaceae as stated

in much of the literature and thus not a milkweed specialist in the sense of *Oncopeltus fasciatus*. Caldwell (1974) contrasted the migratory strategies of these lygaeines, noting that *kalmii* remains in its habitat year round rather than engaging in migratory flights. According to Caldwell, it flies to new habitats only when food or mates are scarce; he referred to its tracking of new milkweed stands as "more opportunistic" than in *O. fasciatus*.

L. kalmii also may be more an opportunist in its utilization of food resources. Adults obtain nectar from flowers in early spring and later in the season, sometimes "moving systematically from nectary to nectary" (Hunt, 1979). In late summer and fall *L. kalmii* may feed on seeds and other structures found on old flower heads.

L. kalmii also uses milkweeds for reproduction, and various asclepiads may represent preferred hosts. The similarity in distribution of *kalmii* and *Aclepias syriaca* L. and *A. speciosa* Torr. (Slater and Knop, 1969) suggests a dependence on these plants if not an extensive coevolutionary history.

But the finding of nymphs on various composites and on plants of unrelated families suggests that *L. kalmii* develops also on nonmilkweed hosts. The observation of 1 or a few late instars on other plants may be based on nymphs that have ascended after completing most of their development elsewhere. It is known that nymphs feed on fallen seeds of their hosts and that 5th instars may climb plants at metamorphosis (Hunt, 1979). It is likely, however, that the nymphs found on *Senecio vulgaris* and buckwheat completed their development on those plants.

The evidence indicates that *L. kalmii* reproduces on plants other than Asclepiadaceae or the related Apocynaceae, perhaps "getting by" before milkweed pods are formed. Hunt found that this multivoltine lygaeid was not common on milkweed in southern Michigan until late June and not abundant until July or August. She characterized *kalmii* as an opportunistic forager which preferred milkweeds but fed on a succession of angiosperms when asclepiads were scarce or unavailable. It is not clearly stated, however, whether this foraging involved adults only or if nymphs occurred on nonmilkweed hosts.

Assuming reproduction takes place on plants other than milkweeds, my observations and Hunt's may help explain the relatively few nymphs Dailey et al. (1978) collected on milkweed in Ohio (152 compared to 1,021 adults). Nymphs may have fed on fallen milkweed seeds, but it is possible that they developed on plants of other families. Feeding on nonmilkweed hosts may also explain the differences in cardenolide content that Isman et al. (1977) found in field-collected *L. kalmii* in California.

Observations of *L. kalmii* on composites and other plants unrelated to the Asclepiadaceae and Apocynaceae suggest a comparison with the Palearctic lygaeine *L. equestris* L. This species, although preferring the asclepiad *Cynanchum vincetoxicum* (L.) Pers., feeds on a succession of hosts through-

out the season. It has been observed on more than 60 plant species in 37 families; nymphs have been associated with 13 species in 11 families (Solbreck and Kugelberg, 1972). Another milkweed-associated lygaeine that is known to develop on composites is *Spilostethus pandurus* var. *elegans* (Wolff) in South Africa (Slater and Sperry, 1973). A lygaeine perhaps preferring seeds of Asteraceae and feeding on some of the same composite genera as *L. kalmii* (e.g., *Achillea, Senecio*) is the widely distributed *Neacoryphus bicrucis* (Say) (Solbreck and Pehrson, 1979).

Careful field studies are needed to determine the similarity in feeding strategies between *L. kalmii* and *L. equestris*. Such work will help determine whether oviposition occurs a considerable distance from potential food plants (as Kugelberg, 1977, has reported for *L. equestris*), whether the occurrence of nymphs on aerial portions of plants reflects only a shortage of seeds on the ground, the extent to which feeding preferences vary throughout the geographic range, whether resource utilization changes during development (as Puchkov, 1956, has discussed for various phytophagous Heteroptera), and whether feeding on nonmilkweed plants represents a recent shift in the host spectrum similar to the use of oleander (*Nerium oleander* L.—Apocynaceae) by *Oncopeltus fasciatus* in Florida (Klausner et al., 1980).

ACKNOWLEDGMENTS

I thank the Rev. James M. Sullivan (St. Louis, Missouri) for letting me refer to his observations on *Lygaeus kalmii*. R. J. Hill (Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg) identified many of the plants from Pennsylvania and West Virginia. For helpful comments on an early draft of the manuscript I thank E. R. Hoebeke (Department of Entomology, Cornell University, Ithaca, New York), R. B. Root (Section of Ecology & Systematics, Cornell University), and J. A. Slater (Biological Sciences Group, University of Connecticut, Storrs).

LITERATURE CITED

Balduf, W. V. 1943. New food records of entomophagous insects (Hym., Dip., Col., Orth., Hemip.). Entomol. News 54:12–15.

Caldwell, R. L. 1974. A comparison of the migratory strategies of two milkweed bugs, *Oncopeltus fasciatus* and *Lygaeus kalmii*. Pages 304–316 *in:* L. Barton-Browne (ed.), Experimental Analysis of Insect Behaviour. Springer-Verlag, New York.

Dailey, P. J., R. C. Graves and J. L. Herring. 1978. Survey of Hemiptera collected on common milkweed, *Asclepias syriaca,* at one site in Ohio. Entomol. News 89:157–162.

Duarte, J. and D. M. Calabrese. 1982. Is the binomen *Lygaeus kalmii* Stål (Hemiptera: Heteroptera: Lygaeidae) applied to sibling species? Proc. Entomol. Soc. Washington 84: 301–303.

Duffey, S. S. and G. G. E. Scudder. 1972. Cardiac glycosides in North American Asclepiadaceae, a basis for unpalatability in brightly coloured Hemiptera and Coleoptera. J. Insect Physiol. 18:63–78.

Hunt, L.-M. 1979. Observations of the habits of *Lygaeus kalmii angustomarginatus* (Hemiptera:Lygaeidae) in southern Michigan. Great Lakes Entomol. 12:31–33.

Isman, M. B., S. S. Duffey and G. G. E. Scudder. 1977. Variation in cardenolide content of the lygaeid bugs, *Oncopeltus fasciatus* and *Lygaeus kalmii kalmii* and of their milkweed hosts (*Asclepias* spp.) in central California. J. Chem. Ecol. 3:613–624.

Klausner, E., E. R. Miller and H. Dingle. 1980. *Nerium oleander* as an alternative host plant for south Florida milkweed bugs, *Oncopeltus fasciatus.* Ecol. Entomol. 5:137–142.

Kugelberg, O. 1977. Distribution, feeding habits and dispersal of *Lygaeus equestris* (Heteroptera) larvae in relation to food supply. Oikos 29:398–406.

Maw, M. G. 1976. An annotated list of insects associated with Canada thistle (*Cirsium arvense*) in Canada. Can. Entomol. 108:235–244.

Procter, W. 1946. Biological Survey of the Mount Desert Region. Part VII. The Insect Fauna. Wistar Inst. Anat. Biol., Philadelphia, 566 pp.

Puchkov, V. G. 1956. Basic trophic groups of phytophagous hemipterous insects and changes in the character of their feeding during the process of development (in Russian). Zool. Zh. 35:32–44.

Scudder, G. G. E. and S. S. Duffey. 1972. Cardiac glycosides in the Lygaeinae (Hemiptera: Lygaeidae). Can. J. Zool. 50:35–42.

Slater, J. A. 1983. On the biology and food plants of *Lygaeus turcicus* (Fabr.) (Hemiptera: Lygaeidae). J. New York Ent. Soc. 91:48–56.

Slater, J. A. and N. F. Knop. 1969. Geographic variation in the North American milkweed bugs of the *Lygaeus kalmii* complex. Ann. Entomol. Soc. Amer. 62:1221–1232.

Slater, J. A. and B. Sperry. 1973. The biology and distribution of the South African Lygaeinae, with descriptions of new species (Hemiptera:Lygaeidae). Ann. Transvaal Mus. 28:117–201.

Solbreck, C. and O. Kugelberg. 1972. Field observations on the seasonal occurrence of *Lygaeus equestris* (L.) (Het., Lygaeidae) with special reference to food plant phenology. Entomol. Scand. 3:189–210.

Solbreck, C. and I. Pehrson. 1979. Relations between environment, migration and reproduction in a seed bug, *Neacoryphus bicrucis* (Say) (Heteroptera:Lygaeidae). Oecologia 43: 51–62.

Received September 24, 1982; accepted October 13, 1982.